

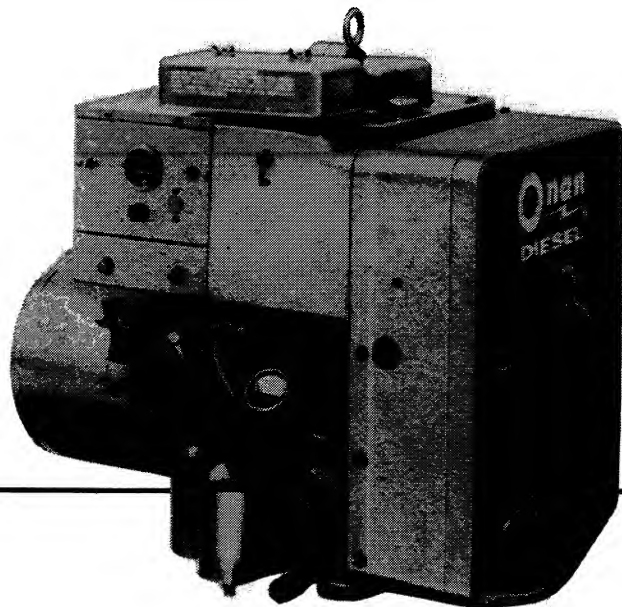
Onan

Operator's Manual

3.0 kW

DJA

GenSet



967-0124
(SPEC V)
8-87

Printed in U.S.A.

Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. Safe and efficient operation can be achieved only if the unit is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

⚠ DANGER *This symbol warns of immediate hazards which will result in severe personal injury or death.*

⚠ WARNING *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

⚠ CAUTION *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

FUEL AND FUMES ARE FLAMMABLE. Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks with the engine running unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR ALLOW AN OPEN FLAME near the generator set or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be adequately secured and free of leaks. Fuel connections at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure that all fuel supplies have a positive shutoff valve.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases. Inspect the exhaust system daily for leaks per the maintenance schedule. See that exhaust manifolds are secure and are not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands away from moving parts.
- Before performing any maintenance on the generator set, disconnect the starting battery negative (–) ground lead first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.

- Do not wear loose clothing or jewelry while servicing any part of the generator set. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK WILL CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT THE GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL POWER SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

GENERAL SAFETY PRECAUTIONS

- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam on electrical fires. Use extinguisher rated ABC by NFPA.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Make sure that rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause over heating and engine damage, and present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

General Information

YOUR MANUAL

This manual contains operation and other information to properly maintain, service, and make adjustments on your generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important part of repair is diagnosis, a troubleshooting chart is included.

Throughout the manual, engine end of the generator set is the front. Left and right sides are determined when facing the engine (front) end.

MODEL DESIGNATION

When contacting your Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate. This information is necessary to identify your generator set among the many types manufactured by Onan.

Onan electric sets are given a complete running test under various load conditions and are thoroughly checked before leaving the factory. Upon receiving your unit, check it thoroughly for any damage that may have occurred during shipping. Tighten loose parts, replace missing parts and repair any damage before operating the unit.

Where applicable, metric equivalents appear in parentheses following the U.S. customary units.

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Specifications

GENERAL

Nominal dimension of set (inches)	
Height	26.19 (665 mm)
Width	19.69 (500 mm)
Length	30.31 (770 mm)
Weight (nominal)	348 (158 kg)

ENGINE DETAILS

Number cylinders	1
Displacement (cubic inch)	30 (491 cm ³)
Cylinder bore	3.25 (82.55 mm)
Piston stroke	3.625 (92.08 mm)
RPM (for 60 hertz)	1800
RPM (for 50 hertz)	1500
Compression ratio	19:1
Governor, Internal Flyball, External Adjustment	Yes
Centrifugal start-disconnect switch	Yes

CAPACITIES AND REQUIREMENTS

Battery voltage (AC set)	12 volt
Battery size	
SAE Group, 1H 6 Volt	Two in Series
Cold Cranking Amps @ 0°F (-18°C)	450
Battery charge rate amperes	2-5
Charge ammeter scale	5-0-5
Oil Capacity in U.S. quarts — Refill★	2.5 (2.37 lit)
Ventilation required (cfm 1800 rpm)	
Engine (Pressure Cooling)	440 (12.46 m ³ /min)
Generator	75 (2.12 m ³ /min)
Combustion	16 (0.45 m ³ /min)
Diesel fuel lift (maximum in feet)	6 (1.8 m)

GENERATOR

Output rated at unity power factor load	1 & 3 phase
Starting by exciter cranking generator windings	Yes
Rating (output in watts)	
**50 hertz AC — General Utility	2500
60 hertz AC — General Utility	3000
AC voltage regulation in %	10
AC frequency regulation in %	5
Revolving armature generator	Yes
Rotating exciter	Yes

TUNE-UP SPECIFICATIONS

Cylinder head bolt torque (lbs. ft.)†	44-46 (60-62 N•m)
Valve clearance	
Intake011" (0.28 mm)
Exhaust008" (0.20 mm)
Anti-flicker breaker point gap025" (0.64 mm)

* Mobile or outdoor operation during ambient temperatures below 0°F (-18°C), use 560 amp cold cranking rating.

★ Plus 1/2 quart (.47 lit) for new filter.

† Apply Never Seeze or equivalent to capscrew threads and under capscrew head.

Description

GENERAL

An Onan DJA Series electric generating set consists of a one-cylinder diesel engine and a 3.0 kW (2.5 kW for 50 Hertz) alternating current generator with standard or optional equipment as ordered.

ENGINE

The DJA engine has 30 cubic inch (491 cm³) piston displacement, 19 to 1 compression ratio, and is air-cooled. Basic measurements and other details are listed under *SPECIFICATIONS*.

GENERATOR

The generator is a revolving armature, 4-pole, single phase, self-excited model of drip-proof construction. The generator aligns to the engine through a rigid coupling and incorporates an engine cranking winding. A commutator, collector rings and associated brushes provide the electrical connections.

CONTROLS

The standard control box has a battery charge rate ammeter, pre-heat switch, a START-STOP switch and fuse.

The following is a brief description of typical controls.

Start-Stop Switch: Starts and stops the unit locally.

Battery Charge Rate DC Ammeter: Indicates the battery charging current.

Pre-Heat Switch: Provides pre-heat control for manifold heater and glow plug for cold diesel engine starting.

Oil Pressure Gauge: Indicates pressure of lubricating oil in engine (located on the engine).

Fuse: Protects the fuel solenoid, ignition and general control components including the wiring harness.

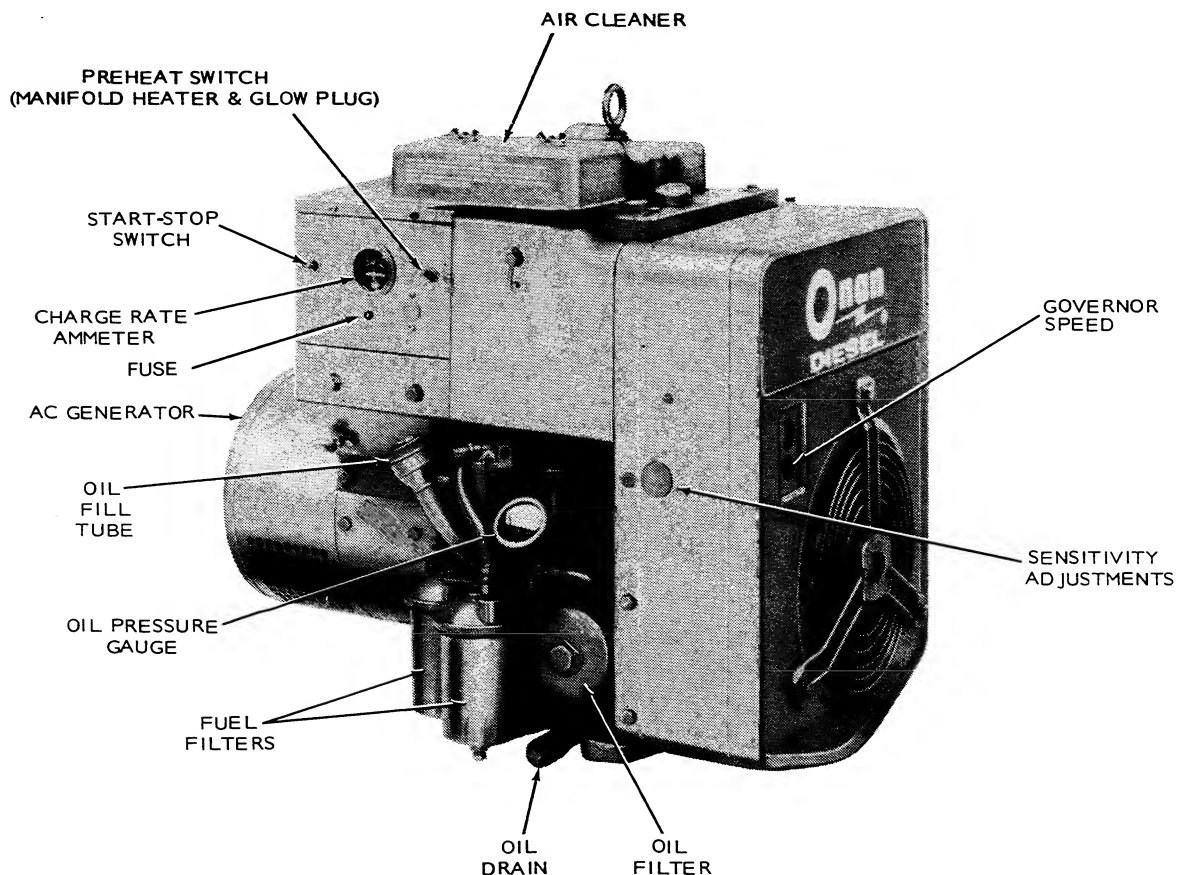


FIGURE 1. TYPICAL MODEL DJA

Installation

GENERAL

Installations must be considered individually, however, the following installation guidelines should be followed. Installations must conform to local building codes, fire ordinances and other local, state or federal regulations. See Figure 2.

Installation points to consider include:

1. Level mounting surface.
2. Adequate cooling air.
3. Adequate fresh induction air.
4. Discharge of circulated air.
5. Discharge of exhaust gases.
6. Electrical connections.
7. Fuel connections.
8. Accessibility for operation and servicing.
9. Vibration isolation.
10. Noise levels.

LOCATION

Provide a location that is protected from the weather and is dry, clean, dust free and well ventilated. If practical, install inside a heated building for protection from extremes in weather conditions.

The air discharge side of set requires 3 inches (76 mm) clearance from wall to permit set to rock on its mounts; at least 24 inches (610 mm) clearance is required around all other sides for service accessibility.

MOUNTING

A permanent type installation (Figure 2) needs a sturdy, level, mounting base of concrete, a heavy wood or structural steel at least 12 inches (305 mm) high to aid oil changing and operating. Place the 7/16 inch mounting bolts as shown in Figure 2.

For mobile applications (trucks or trailers), install slide out rails or some other means (such as doors) to provide service access.

Carefully assemble the mounting cushions, washers and spacer bushing on the mounting bolts. The spacer bushing prevents compression of the snubber (upper rubber cushion).

▲CAUTION *One half inch (12 mm) clearance is required between oil filter and mounting bolt to avoid puncturing filter.*

VENTILATION AND COOLING

Air circulation is needed to dissipate heat produced by the engine and generator in normal operation. *Outdoor* installations can rely on natural circulation, but *mobile, indoor or housed* installations need properly sized and positioned vents for required air flow. See *SPECIFICATIONS* for the air requirements at 1800 rpm.

Vent sizes depend on variable conditions: (1) size of enclosure, (2) ambient temperature, (3) electrical load, (4) running time, (5) restrictions imposed by screens, louvers, shutters, or filters, and (6) prevailing wind direction.

A required volume of air must reach the unit, absorb the heat, and be discharged away from the installation.

Pressure cooled units need an inlet vent with an unrestricted opening of at least 3-1/2 square feet (.33 m²) for variables. For discharged air, install separate ducts from the engine and generator (see exception) as follows:

1. The *engine discharge duct* must be the same size as the engine outlet, 8 x 8 inches (203 x 203 mm). If a screen is used in the duct, increase the duct size in proportion to the restriction. Consider installing the screen diagonally to limit the restriction and increase duct size for runs over 9 feet (2.8 m). If bends are necessary, use large radius elbows. Use a canvas section at the set to absorb vibration and noise.
2. *Generator outlet ducts* must be used when units are installed in compartments too small for operator to walk. Ducts are recommended for all other indoor installations. The air outlet is 5-5/8 x 3 inches (143 x 76 mm). Follow the same principles of duct design and installation as used for the engine duct. Engine and generator require separate ducts.

Auxiliary fans can be used to increase air flow to units installed in small, poorly ventilated rooms. The fan size and location should be such that the air inlet to the engine doesn't exceed 120° F (49° C) when running at full rated load.

▲WARNING *Utilizing exhaust manifold heat to warm a room or compartment occupied by people is not recommended due to possible leaking of harmful exhaust gases.*

EXHAUST

▲WARNING *Pipe POISONOUS exhaust gas outside enclosure. Inhalation of exhaust gases can result in serious injury or death.*

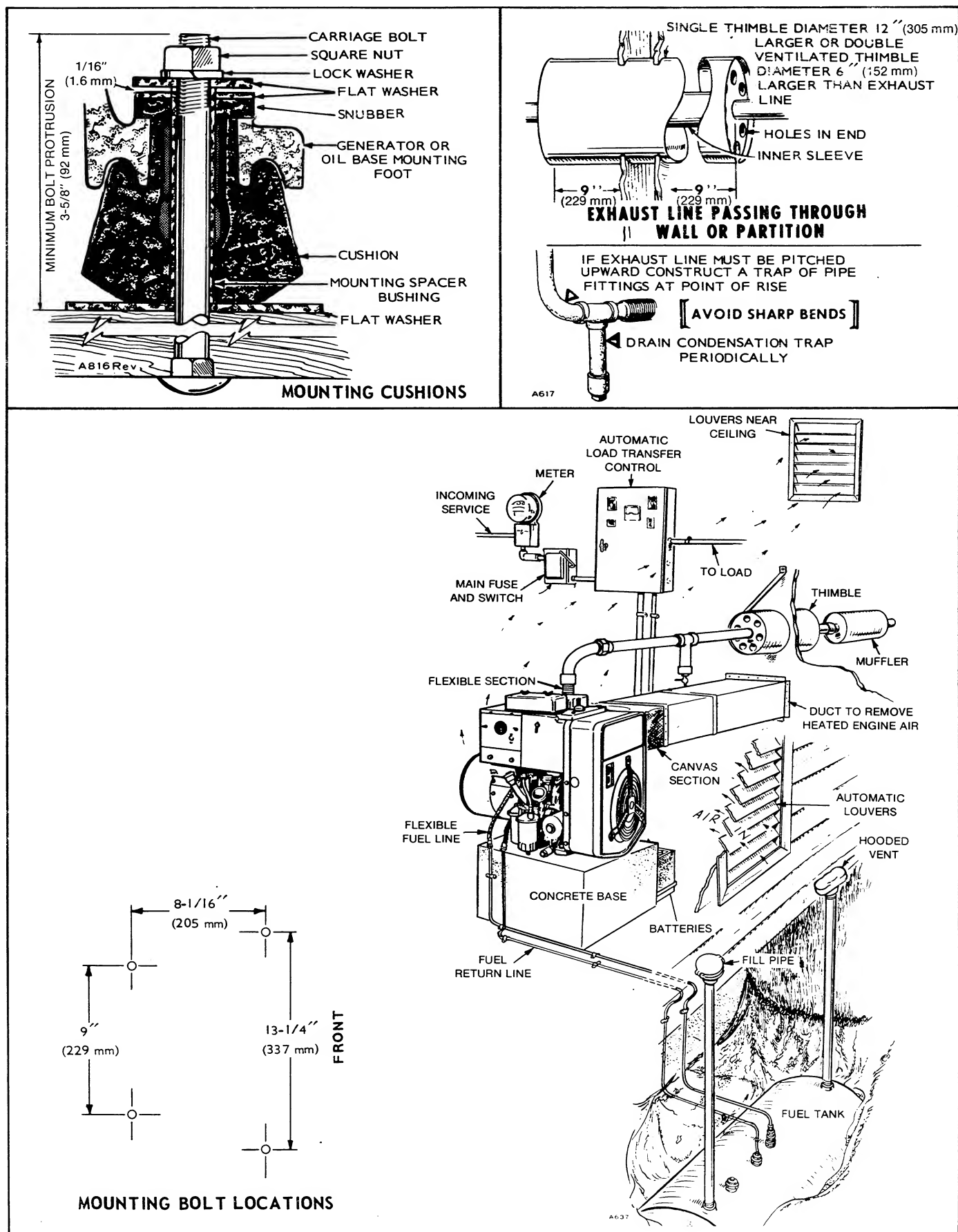


FIGURE 2. TYPICAL INDOOR INSTALLATION

Vent exhaust gases outside. Use flexible tubing between the engine exhaust outlet and rigid piping.

Shield the line if it passes through a combustible wall or partition. If turns are necessary, use long sweeping type elbows. Use one pipe size larger for each ten feet in length. Position the exhaust outlet away from the engine air intake.

OIL DRAIN

Extend to suit installation. Oil base has a 1/2 inch pipe tapped hole.

FUEL TANK

If a separate fuel tank is used, install the tank so the bottom is less than 6 feet (1.8 m) below the fuel pump. The tank top must be below fuel pump level to prevent siphoning. Install a shut-off valve at the tank. When the fuel tank is shared with another engine, use a separate fuel line for each to avoid starving the set.

If fuel lift must exceed 6 feet, install an auxiliary electric fuel pump at the fuel supply.

FUEL CONNECTION

Connect the fuel line to the fuel pump inlet. Pump is threaded 7/16-24 NPTF (American Standard Internal Tapered Pipe Thread).

⚠ WARNING *Always use flexible tubing between engine and the fuel supply to avoid line failure and leaks due to vibration. Leaking fuel can explode causing severe injury.*

The diesel engine requires a fuel supply line and a separate fuel return line. Install the fuel return line from the 7/16-24 size opening in the overflow fitting located on the injection pump (where the nozzle fuel return line is also connected) to the top of the fuel supply tank, Figure 2).

⚠ WARNING *Do not use galvanized lines, fittings, or fuel tanks in underground portions of the fuel system. Hazardous fuel leaks may be caused by electrolytic corrosion from moisture and chemicals in the soil (galvanism). Some safety ordinances prohibit the use of galvanized materials in fuel systems and the use of threaded cast iron fittings as well. Carefully clean all fuel system components before putting the unit into operation. Any dirt or contamination may cause major damage to the fuel injection system.*

ELECTRICAL CONNECTIONS

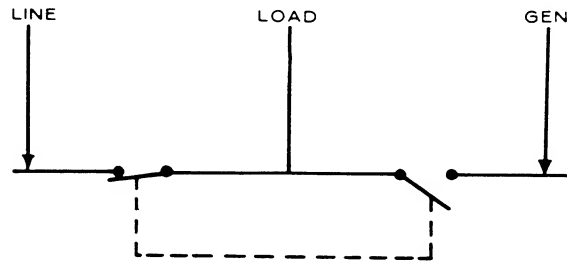
The nameplate on the generator set shows the electrical output rating of the generator in watts, volts, and hertz. The wiring diagram, shipped with the generator set, shows the electrical circuits and connections needed during installation.

Meet all applicable electrical code requirements. Work should be done by a qualified serviceman or electrician because the installation will be inspected.

LOAD WIRES

The control box (junction box) has knock out sections to accommodate load wires. Use flexible conduit and stranded load wires near the set to absorb vibration. Use sufficiently large insulated wires. Strip insulation from wire ends as necessary for clean connections. Connect each load wire to the proper generator output lead inside the set box. Insulate bare ends of ungrounded wires. Use bolt provided on the control box to connect the generator ground lead and load wire. Install a fused main switch (or circuit breaker) between the generator and load.

Standby: If the installation is for standby service, install a double-throw transfer switch (either manual or automatic type) to prevent feeding generator output into the normal power source lines and to also prevent commercial power and generator output from being connected to the load at the same time. Instructions for connecting an automatic load transfer switch is included with such equipment. See Figure 3.



NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 3. LOAD TRANSFER SWITCH (TYPICAL FUNCTION)

Balance All Loads: Divide the loads equally between output leads. Current loads for any one output lead must not exceed nameplate rating. Refer to Figure 4.

⚠ CAUTION *Overloading can damage the generator windings. Divide the loads equally between output leads.*

Output Lead Markings: Leads on revolving field generators are marked M1, M2, etc. These identifying marks also appear on the wiring diagram.

SWITCHBOARD

A wall mounted switchboard containing ammeters, a voltmeter, and circuit breakers is optional. When used, the following connections apply:

1. Connect one ungrounded (hot) generator lead to the unused terminal on each ammeter.
2. Connect the generator lead and load wires which are to be grounded to the ground stud on the switchboard.
3. Connect one ungrounded (hot) load wire to the unused terminal on each circuit breaker.
4. On sets that generate more than one voltage (example: 120/240), the voltmeter should be wired to indicate the higher of the two voltages.

GENERATORS

Generators on DJA sets are self excited, revolving armature units with engine cranking windings. The load connections are shown in Figure 4.

Reconnectable Single Phase Generators: Code 3C models, such as DJA-3C are reconnectable for use as 120/240 volt 3 wire; 120 volt two wire; or 240 volt 2 wire units except when optionally equipped with a meter panel.

Grounding: A number 8 or larger wire should be used to connect the generator housing to a rod or pipe that penetrates into moist earth. If a solderless connector is not provided on the generator, connect the ground wire at the battery ground stud on the engine.

BATTERY CONNECTIONS

The battery is connected for negative (—) ground, Figure 5. Be sure all battery connections are secure.

Exciter Cranked Sets: If battery ground must be changed, reverse connections to the charge ammeter or re-mark the correct direction of polarity. Figure 5. Crank electrically to flash field.

Provide two 6 volt batteries connected in series (one battery's negative to other battery's positive) for a 12 volt source. See *SPECIFICATIONS* for minimum battery requirements. Connect the remaining battery positive (+) to the start solenoid (located in the control box). Connect the battery negative (—) to a good ground on the generator frame.

Sets using load transfer (Figure 3) or automatic demand control must be connected for a negative ground.

REMOTE START-STOP SWITCH (OPTIONAL)

For remote control starting and stopping, use 3 wires to connect the remote switch (single pole, double throw, momentary contact, center-off type) to the terminal block marked B+, 1, 2, 3, in the set control box using wire sizes as listed in Figure 6. Preheat circuit requires an extra wire to terminal H and momentary contact switch (SPST) connections.

Remove jumper between terminals 3 and H before installing remote wiring.

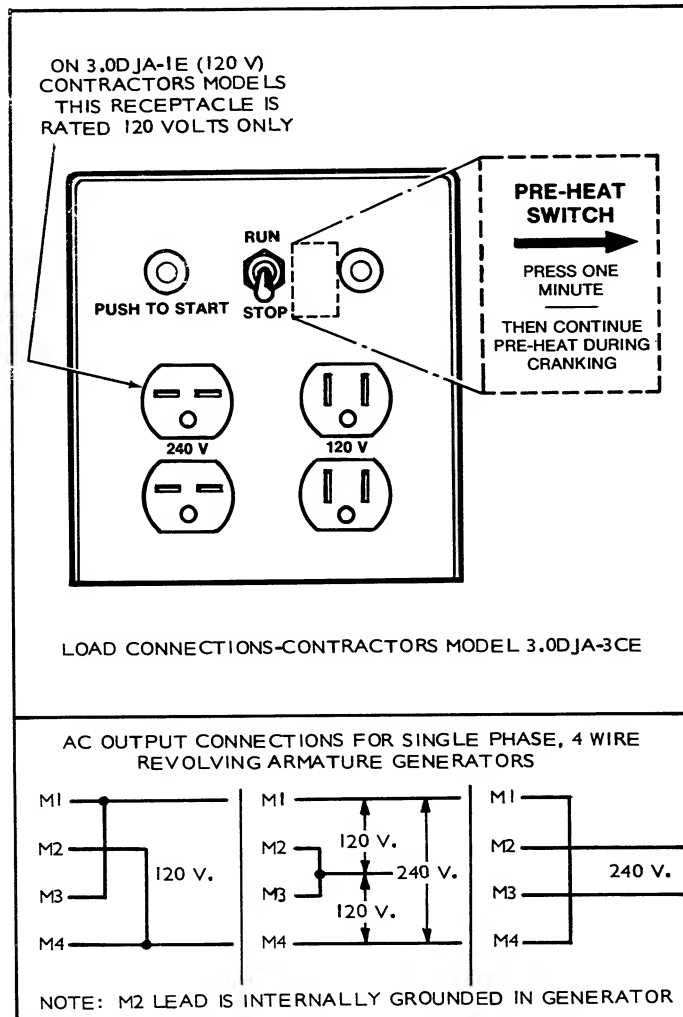


FIGURE 4. LOAD CONNECTIONS

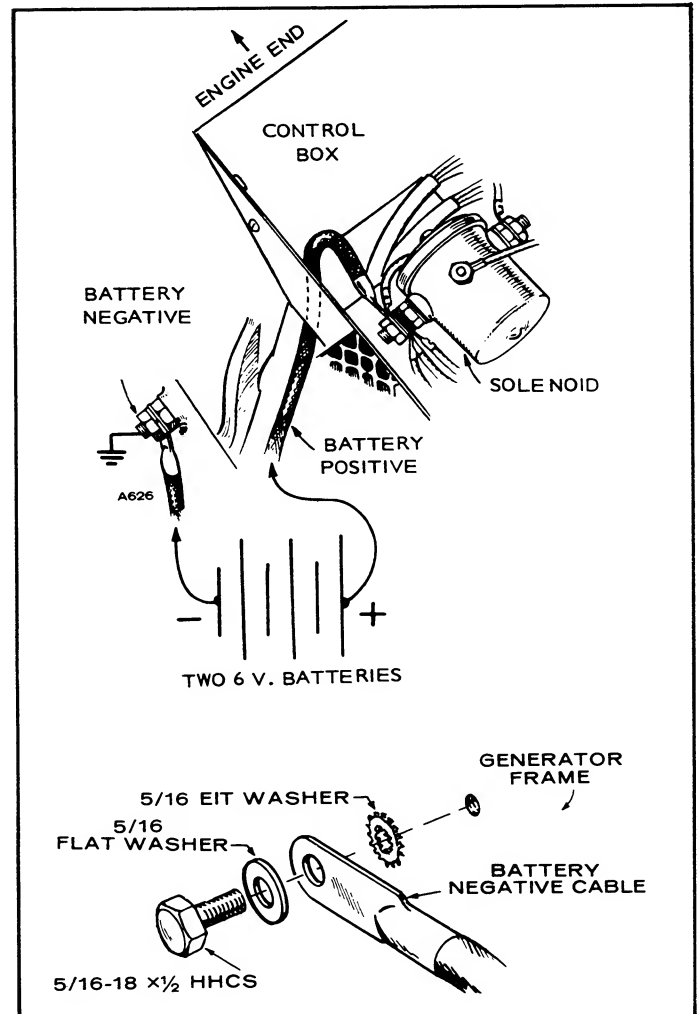


FIGURE 5. BATTERY CONNECTIONS

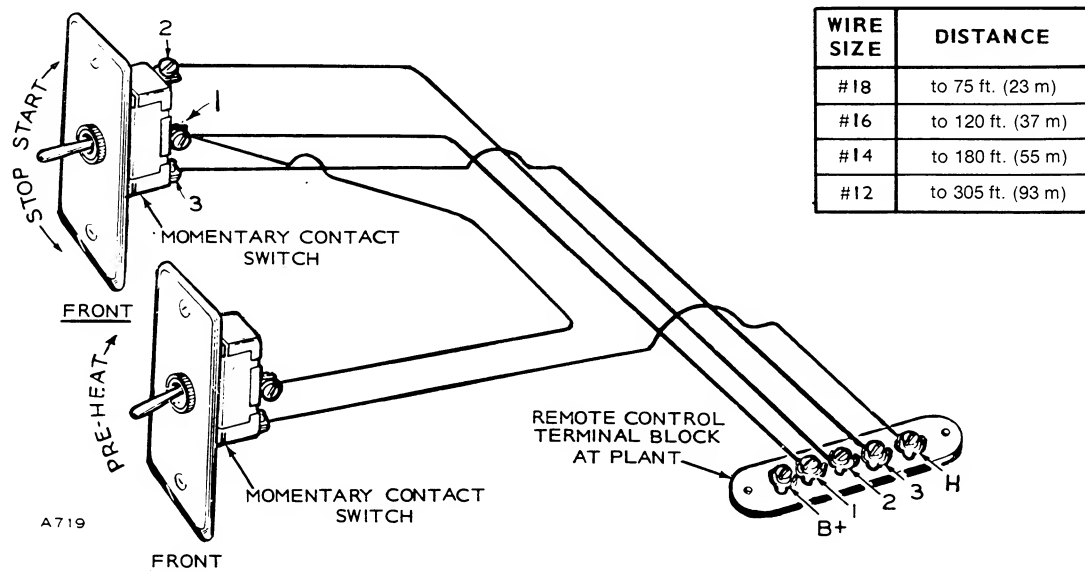


FIGURE 6. REMOTE CONTROL

Operation

⚠ WARNING

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:

- Dizziness
- Nausea
- Headache
- Weakness and Sleepiness
- Throbbing in Temples
- Muscular Twitching
- Vomiting
- Inability to Think Coherently

IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate until it has been inspected and repaired.

Protection against carbon monoxide inhalation includes proper installation and regular, frequent visual and audible inspections of the complete exhaust system.

PRE-STARTING

Before generator set is put into operation, check all components for mechanical security. If an abnormal condition, defective part, or operating difficulty is detected, repair or service as required. Generator set should be kept free of dust, and spilled oil or fuel.

Crankcase Oil

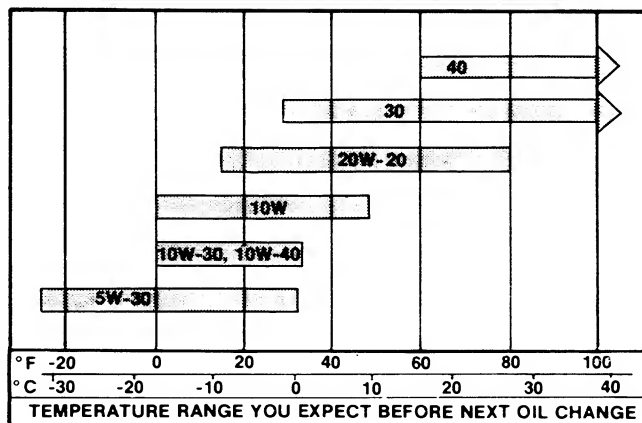
Use an oil with the American Petroleum Institute (API) designation CD/SF. However, to reduce oil consumption to a normal level in the shortest time possible on a new or rebuilt engine, use CC/SF oil for the first fill only (50 hours). Then use the recommended oil only. Select the correct SAE viscosity grade oil by referring to the following.

Multigrade oils (CC/SF or CD/SF) are recommended for temperatures of 23°F (0°C) and below, but they are not recommended for temperatures above 32°F (0°C). When adding oil between oil changes, use the same brand because different brands of oil may not be compatible.

⚠ WARNING

Never check oil level while engine is running. Hot oil discharged from the engine could cause personal injury.

USE THESE SAE VISCOSITY GRADES



AMBIENT TEMP. RANGE	RECOMMENDED VISCOSITIES	REQ'D QUALITY LEVELS (API CLASS)
60°F and warmer	SAE 40	CD/SE
32°F and warmer	SAE 30	
15°F to 80°F	SAE 20W-20	
0°F to 50°F	SAE 10W	
0°F to 32°F	SAE 10W-30, 10W-40	CD/SE or CC/SE
-25°F to 32°F	SAE 5W-30	CD/SE or CC/SE

Refer to Chart for Celsius Temperature Conversions.

Recommended Fuel

Use ASTM 2-D or 1-D fuel with a minimum Cetane number of 45*. Number 2 diesel fuel gives the best economy for most operating conditions; however, use ASTM 1-D fuel during the following conditions:

1. When ambient temperatures are below 32°F (0°C);
2. During long periods of light engine load; or no load.

***NOTE:** Fuels with Cetane numbers higher than 45 may be needed in higher altitudes or when extremely low ambient temperatures are encountered to prevent misfires.

Use low sulfur content fuel having a pour point (ability to filter) of at least 10°F (-12°C) below the lowest expected temperature. Keep the fuel clean and protected from adverse weather. Leave some room for expansion when filling the fuel tank.

⚠ CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important the fuel be kept clean. Dirt or water in the system can cause severe damage to both the injection pump and the injection nozzles.

Bleeding Fuel System: Disconnect fuel return line and operate hand priming lever on fuel transfer pump (Figure 7) until fuel flows bubble free from fuel return line. Then reconnect the fuel return line fitting.

If the camshaft's pump lobe is up, crank engine one revolution to permit hand priming. When finished, return priming lever inward (disengaged position) to permit normal pump operation.

An alternate and perhaps more effective bleeding method can be used. Completely loosen the lower nut on the injection pump to nozzle fuel line. Loosen the delivery valve holder, located below the fuel line nut, until it can be turned with the fingers. Crank engine until clear fuel emerges around the loosened delivery valve holder. Retighten the delivery valve holder and fuel line. Fuel injection should occur almost immediately when engine is cranked.

STARTING SEQUENCE

The starting and stopping sequence lists the manual, mechanical, and electrical events required for satisfactory start, run, and stop cycles. Figure 8 illustrates controls for starting and stopping sequence.

PRE-HEATING AND STARTING

Extremes in starting temperatures may require additional preheating. If engine fails to start quickly, rest engine several seconds and repeat starting sequence applying preheat for a longer interval using heater switch.

See opposite page for comprehensive engine starting guide.

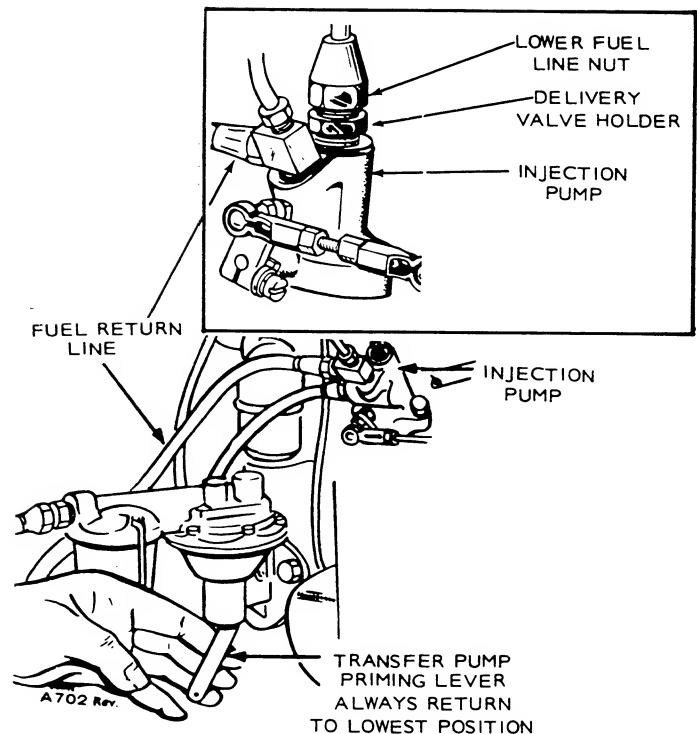


FIGURE 7. BLEEDING THE FUEL SYSTEM

1. For cold engine starting below 55°F (13°C), depress the manifold heater switch for one minute.
2. Push START-STOP switch to its START position.
3. Release switch after engine starts and reaches speed.
4. Oil pressure should read at least 20 psi (138 kPa) (pressure-relief valve is not adjustable).

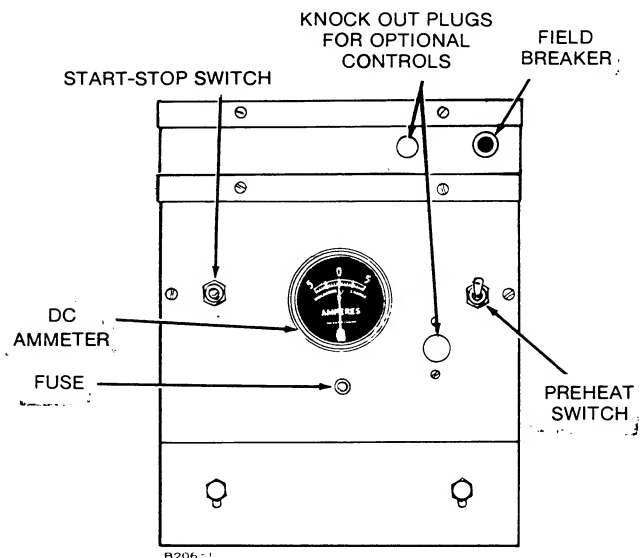


FIGURE 8. STANDARD CONTROL PANEL

ONAN DIESEL STARTING GUIDE (DJA, MDJA)

IMPORTANT!

KEEP ENTIRE FUEL SYSTEM CLEAN AND FREE FROM WATER

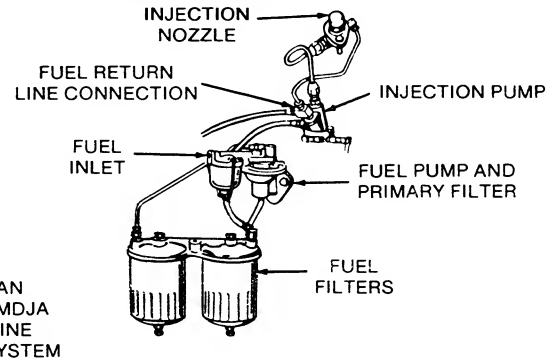
- DIESEL INJECTION PUMPS WILL FAIL IF SYSTEM CLEANLINESS IS NEGLECTED

INJECTION PUMPS AND NOZZLES ARE NOT FIELD REPAIRABLE

- WHEN TROUBLESHOOTING, CHECK ALL OTHER COMPONENTS FIRST

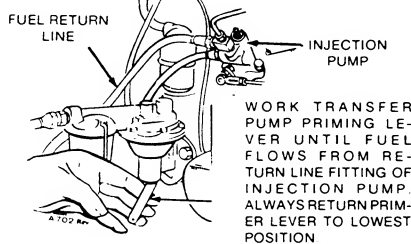


DO NOT USE ETHER STARTING AIDS! ETHER IS EXTREMELY EXPLOSIVE AND MAY CAUSE SERIOUS PERSONAL INJURY. ENGINE DAMAGE IS ALSO LIKELY.



BEFORE STARTING:

CHECK FUEL SUPPLY. BE SURE SHUTOFF VALVES ARE OPEN.



PRIME FUEL SYSTEM IF: FUEL FILTERS WERE DRAINED OR CHANGED, SYSTEM WAS JUST INSTALLED, FUEL TANK RAN DRY.

TO PRIME PUMP, MOVE PRIMING LEVER UP AND DOWN UNTIL FUEL FLOWS STEADILY FROM RETURN LINE (DISCONNECTED). IF NECESSARY, USE SURER ALTERNATE METHOD AS DESCRIBED IN MANUAL.

PREHEAT



PREHEAT COLD ENGINE: PUSH PREHEAT SWITCH AND HOLD —

- 30 SECONDS IF ABOVE 55°F (13°C);
- 60 SECONDS IF BELOW 55°F (13°C).

TO START:

PREHEAT



RELEASE PREHEAT

START



ENGAGE START SWITCH

LIMIT CRANKING TO 15 TO 20 SECONDS TO CONSERVE BATTERY. ALLOW 1 MINUTE BEFORE RE-CRANKING.

IF ENGINE DOES NOT START:

IF ENGINE FIRED, REPEAT ABOVE PROCEDURES, INCLUDING PRE-HEAT. IF IT STILL DOES NOT START, PROCEED AS FOLLOWS:

TEMPERATURES BELOW 32°F (0°C):

USE NUMBER 1 DIESEL FUEL. USE CORRECT VISCOSITY OIL. KEEP BATTERIES FULLY CHARGED. DO NOT USE ETHER STARTING AID.



OBSERVE ENGINE EXHAUST "SIGNALS":

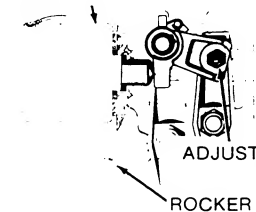
BLUE-WHITE EXHAUST SMOKE: ENGINE IS GETTING FUEL (FUEL FLOWS STEADILY FROM FUEL RETURN LINE).

CHECK PREHEAT SYSTEM:

- ENGAGE PREHEAT AND OBSERVE HEATER THRU AIR INLET HOLE OR BY REMOVING AIR CLEANER. ELEMENT SHOULD GLOW RED WITHIN 30 SECONDS—IF NOT, CHECK FOR CLEAN, TIGHT CONNECTIONS.

CHECK DECOMPRESSION MECHANISM:

SOLENOID



- AS CRANKING SPEED INCREASES, OIL PRESSURE SWITCH ACTIVATES SOLENOID, EXHAUST VALVE CLOSSES AND CAUSES COMPRESSION.

- CHECK ADJUSTMENT AS OUTLINED IN MANUAL.

LITTLE OR NO SMOKE. PRIME FUEL SYSTEM AS SHOWN ABOVE.

LITTLE OR NO FUEL FLOW FROM RETURN LINE.

FUEL FLOW FROM RETURN LINE, STILL NO SMOKE?

CHECK FUEL SUPPLY SYSTEM:

- FUEL TANK EMPTY?
- SHUTOFF VALVES CLOSED?
- FUEL LINES KINKED?
- LOOSE CONNECTIONS?
- CLOGGED FUEL FILTERS?

USE ALTERNATE BLEEDING METHOD AS STATED IN MANUAL.

CHECK TRANSFER PUMP:

- CRANK ENGINE AND OBSERVE FUEL FLOW FROM RETURN LINE. IF FUEL DOES NOT SPURT OUT, PUMP MAY BE DEFECTIVE.

⚠ CAUTION

Do not apply overvoltage to the starting circuit at any time. Overvoltage will destroy the glow plugs and air heater in 2 to 3 seconds. If it becomes necessary to use an additional source of power to start the set, use a 12 volt battery connected in parallel.

AUTOMATIC STARTING AND STOPPING

Separate controls may be used for automatic start and stop, but must provide engine preheating.

The automatic control has a time delay relay to preheat glow plugs and the manifold heater for about 20 seconds before cranking occurs. The time delay relay prevents immediate engagement of the starter in case the load is reapplied before the engine stops.

STOPPING

1. Push *start-stop* switch to *stop* position.
2. Release switch when set stops. If stop circuit fails, close fuel valve.

APPLYING LOAD

Allow set to warm up before connecting a heavy load. Continuous generator overload may cause high operating temperatures that can damage the windings. The generator can safely handle an overload temporarily, but for normal operation, keep the load within nameplate rating. The exhaust system may form carbon deposits during operation at light loads; apply full load occasionally before shut-down to prevent excessive carbon accumulations.

Try to connect the load in steps instead of full load at one time. Most installations use a line switch that must be closed to connect a portion of the load.

EXERCISE STANDBY SETS

Infrequent use results in hard starting. Operate standby sets at least 30 minutes each week. Run longer if battery needs charging.

EMERGENCY OPERATION IF BATTERY FAILS

The remote type revolving armature set must always have the battery connected while operating. High voltage will burn relays if battery is disconnected.

BREAK-IN PROCEDURE

The unit should be run in the following sequence:

1. One half hour at 1/2 load.
2. One half hour at 3/4 load.
3. Full load.

Continuous running under one half load during the first few hundred hours usually results in poor piston ring seating, causing higher than normal oil consumption and blowby.

Drain and replace the crankcase oil after 50 hours of operation; drain while the engine is still hot.

OUT-OF-SERVICE PROTECTION

The natural lubricating qualities of No. 2 diesel fuel should protect a diesel engine for at least 30 days when unit is not in service. To protect a set that will be out of service for more than 30 days, proceed as follows:

1. Run set until thoroughly warm; generator under at least 50 percent load.
2. Shut down engine and drain oil base while still warm. Refill and attach a tag indicating viscosity of oil used.
3. Remove glow plug and pour 1-ounce of rust inhibitor (or SAE #10) oil) into cylinder. Crank engine over several times. Install glow plug.
4. Service air cleaner.
5. Clean throttle and governor linkage and protect by wrapping with a clean cloth.
6. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
7. Clean and wipe entire unit. Coat parts susceptible to rust with a light coat of grease or oil.
8. Disconnect battery and follow standard battery storage procedure.
9. Provide a suitable cover for the entire unit.

Returning a Unit to Service

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check warning tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Electrolyte specific gravity of a fully charged battery should be 1.260 at 77°F (25°C). If specific gravity is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity is correct. **DO NOT OVERCHARGE.**

⚠ WARNING

Do not smoke while servicing batteries. Explosive gases are emitted from batteries in operation. Ignition of these gases can cause severe personal injury.

4. Check that fuel injectors and fuel lines are secure and correctly torqued.
5. Connect batteries.
6. Verify that no loads are connected to generator.
7. Start engine.
After engine has started, excessive blue smoke will be exhausted until the rust inhibitor or oil has burned away.
8. After start, apply load to at least 50 percent of rated capacity.
9. Check all gauges to be reading correctly. Unit is ready for service.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to and from the set.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.

LOW TEMPERATURES

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the set to a warm location or apply externally heater air until oil flows freely (never use open flame).
2. Use fresh fuel. Protect against moisture condensation.
3. Keep fuel system clean, and batteries in a well charged condition.
4. Partially restrict cool air flow but use care to avoid overheating.

⚠ CAUTION *Do not use ether starting aids. Piston damage could result.*

5. In extreme cold temperatures it may be necessary to maintain *preheating* up to 2 minutes after the engine starts to obtain smooth firing.

⚠ CAUTION *Do not use preheat for more than one minute before cranking. This will help to prevent heater burn-out and conserve battery power.*

See *Onan Diesel Starting Guide* if starting problems are encountered.

DUST AND DIRT

1. Keep set clean. Keep cooling fins free of dirt, etc.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and fuel in dust-tight containers.
5. Keep governor linkage clean.

HIGH ALTITUDE

Maximum power will be reduced approximately 4 percent for each 1000 feet above sea level, after the first 1000 feet.

Adjustments

ANTI-FLICKER POINTS

The anti-flicker circuit eliminates flare or flickering of lights due to engine rpm change on the power stroke. Replace burned or faulty points. If only slightly burned, dress smooth with file or fine stone. Rotate crankshaft to maximum gap and measure gap with thickness gauge, Figure 9. Loosen and adjust stationary contact to correct gap.

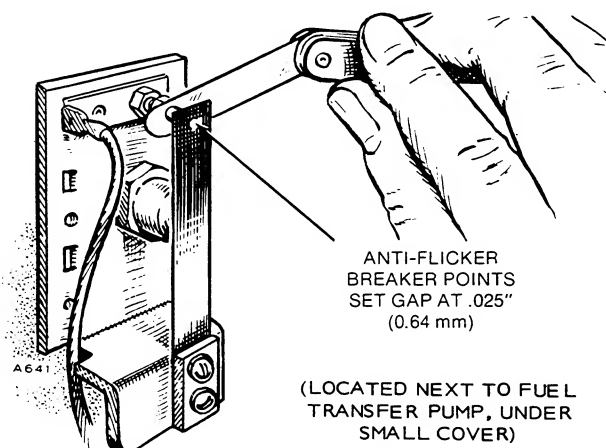


FIGURE 9. SETTING GAP

GOVERNOR

The governor controls engine speed. Rated speed and voltage appear on the nameplate (see *SPECIFICATIONS*). Engine speed equals frequency multiplied by 30, on a 4 pole generator, thus 1800 rpm gives 60 hertz frequency. Preferred speed should not vary more than 3 hertz from no-load to full-load operation. Be sure throttle, linkage, and governor mechanism operate smoothly.

Speed Adjustment: To change the governor speed, change the spring tension by turning the governor spring nut (Figure 10). Turn the nut clockwise (more spring tension) to increase rpm and counterclockwise to reduce governed speed. Hold a tachometer against flywheel cap screw, or use a frequency meter.

Sensitivity Adjustment: To adjust governor sensitivity (no load to full load speed droop) turn the sensitivity adjusting ratchet accessible through a covered access hole on the side of the blower housing. Counterclockwise gives more sensitivity (less speed droop when full load is applied), clockwise gives less sensitivity (more speed droop). If the governor is too sensitive, a rapid hunting condition occurs (alternate increasing and decreasing speed). Adjust for maximum sensitivity without hunting. After sensitivity

adjustment, the speed will require readjustment. After adjusting the governor, replace the knockout plug in the blower housing and secure speed stud lock nut.

Excessive droop may be caused by engine misfiring. Correct this condition before adjusting governor.

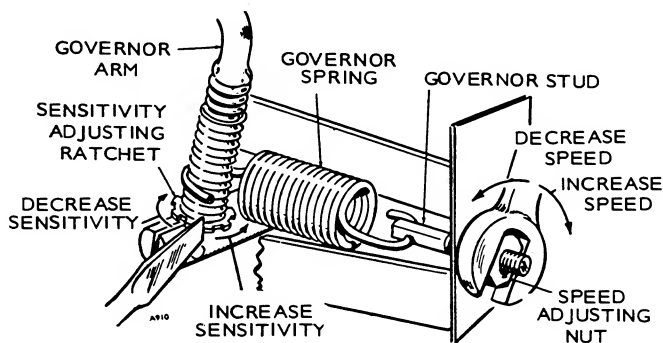


FIGURE 10. GOVERNOR ADJUSTMENT

CHARGE RATE ADJUSTMENT

The adjustable resistor slide tap (in the charging circuit) is set to give approximately 2 ampere charging rate. For applications requiring frequent starts, check battery specific gravity periodically and, if necessary, increase the charging rate slightly (move slide tap nearer ungrounded lead) until it keeps the battery charged. Adjust only when engine is stopped. Avoid overcharging. The resistor is located in the connection box.

If a separate automatic demand control for starting and stopping is used, adjust the charge rate for its maximum 4.5 amperes. This normally keeps battery charged even if starts occur as often as 15 minutes apart.

VALVE CLEARANCE

Check valve clearance when the engine is at room temperature; about 70°F (21°C).

1. Turn the flywheel until the cylinder is on its compression stroke. Use a socket wrench on the flywheel screw hex head.

To determine if the cylinder is in its compression stroke, observe the action of the push rods as the engine is rotated in a clockwise direction. The exhaust valve push rod will be in its lowest position and the intake valve push rod will be moving downward. As the piston reaches top dead center, the flywheel timing mark should be aligned with the timing pointer and the valve push rods stationary.

2. Now turn the flywheel clockwise for an additional 10 to 45 degrees. There is no timing mark for this position, so it must be estimated. With the piston located in this position, it will be in its power stroke with both valves completely closed.
3. Cylinder head bolt torques should be 44 to 46 foot-pounds (60-62 N•m). To change the setting of valve clearance, adjust the locknut which secures the rocker arm to the cylinder head (Figure 11). Loosen the locknut to increase clearance and tighten it to reduce clearance.
4. Check valve clearance with a feeler gauge between the rocker arm and the valve (Figure 12). Increase or reduce the clearance until the proper gap is established. Correct valve clearance is 0.011-inch (0.28 mm) intake and 0.008-inch (0.20 mm) exhaust.

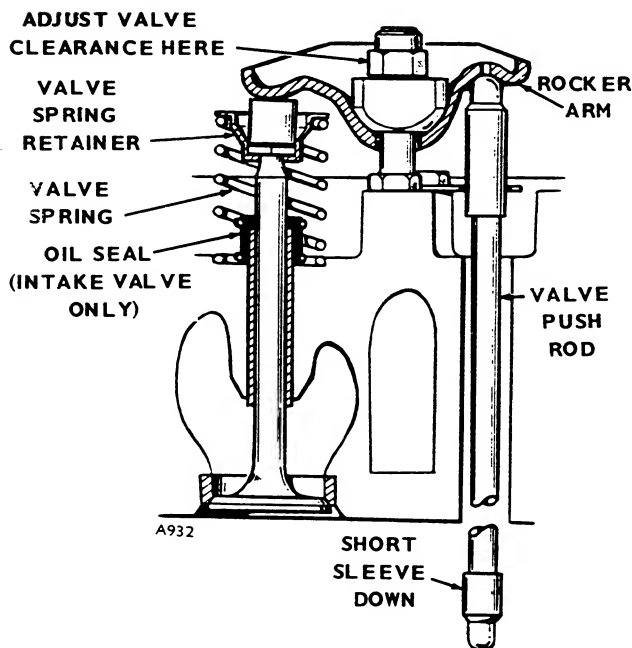


FIGURE 11. SETTING VALVE CLEARANCE

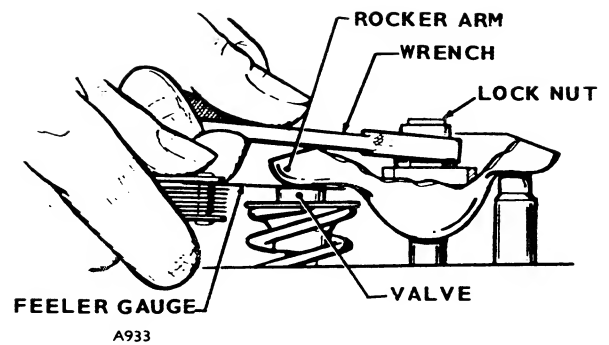


FIGURE 12. CHECKING VALVE CLEARANCE

DECOMPRESSION MECHANISM

The compression release mechanism (Figure 13) allows stopping and starting of the engine. The solenoid deenergizes on shut down to hold the exhaust valve open. During Start, the solenoid energizes after cranking speed is reached and allows the exhaust valve to function normally.

The following adjustment procedure will ensure proper starting and stopping; and will prevent damage to exhaust valve, decompression mechanism or engine.

Before adjusting the decompression mechanism, the valves must be set for the correct clearance.

1. Rotate flywheel 10 to 45 degrees past TDC on power stroke (both valves closed).
2. Hold release arm in the decompression position (full counterclockwise rotation as viewed from above).
 - a. Loosen lock nut and turn set screw so it just touches the rocker arm.
 - b. Turn set screw clockwise one full turn.
 - c. Hold set screw and torque lock nut to 50-55 lb. in. (5.6-6.2 N•m).
3. Rotate release arm to compression position (full clockwise rotation as viewed from above).
 - a. Check for minimum clearance of .010 inch (0.254 mm) between set screw and rocker arm.
 - b. If necessary, back off set screw (CCW rotation) to obtain minimum clearance. Retorque lock-nut.

When reassembling the rocker cover, remove the solenoid and dip the plunger "O" ring in oil. Reinstall solenoid when cover is on the engine. Align solenoid so terminal "SW" is above terminal "IGN."

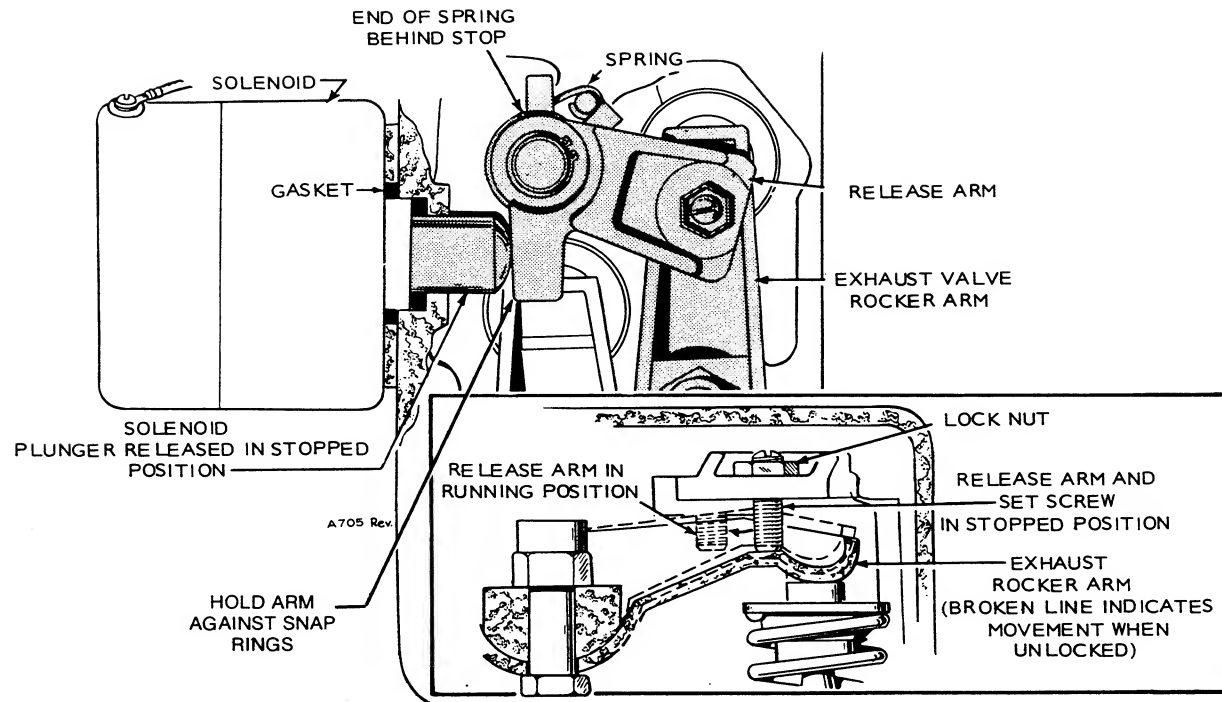


FIGURE 13. DECOMPRESSION MECHANISM

General Maintenance

GENERAL

Follow a regular schedule of inspection and servicing, based on operating hours (Table 1). Keep an accurate logbook of maintenance, servicing, and operating time. Use the running time meter (optional equipment) to keep a record of operation and servicing. Regular service periods are recommended for normal service and operating conditions. For continuous duty, extreme temperature, etc., service more frequently. For infrequent use, light duty, etc., service periods can be lengthened accordingly. Refer to Figures 14 and 15 for engine maintenance information.

⚠ WARNING *Before commencing any maintenance work on the engine, generator, control panel, automatic transfer switch or associated wiring, disconnect batteries. Failure to do so could result in damage to the unit or serious personal injury in the event of inadvertent starting.*

Operator should periodically make a complete visual inspection with set running at rated load. Some of the things to check for are as follows:

1. Check all fuel and oil lines for possible leakage.
2. Inspect exhaust lines and mufflers daily for possible leakage and cracks.
3. Periodically or daily, remove moisture from sediment bowl.
4. Inspect air shrouds for leaks and security. Be sure cooling fins are clean.
5. Inspect electrical wires and connections for security and fray damage.

If generator requires major repair or servicing, contact an authorized Onan dealer or distributor.

AC GENERATOR

Periodic inspections that coincide with engine oil changes will ensure good performance.

BATTERIES

Check the condition of the starting batteries at least every two weeks. See that connections are clean and tight. Keep the electrolyte at the proper level above the plates by adding distilled water. Check specific gravity; recharge if below 1.260.

MAINTENANCE SCHEDULE

Use this factory recommended maintenance schedule (based on favorable operating conditions) to serve as a guide to get long and efficient set life. Neglecting routine maintenance can result in failure or permanent damage to the set.

TABLE 1.
OPERATOR AND SERVICE MAINTENANCE SCHEDULE

HOURS OF OPERATION	MAINTENANCE TASK
8	<ul style="list-style-type: none">• Inspect generator set• Check fuel supply, see Note 1• Check oil level• Check exhaust system
50 (more often in dusty conditions)	<ul style="list-style-type: none">• Check air cleaner, see Figure 14
100	<ul style="list-style-type: none">• Clean governor linkage, see Figure 15• Change crankcase oil• Drain moisture from sediment bowl
200	<ul style="list-style-type: none">• Clean crankcase breather, see Figure 13• Replace oil filter• Check battery condition• Check generator slip rings and brushes; replace if worn to 5/16"
500	<ul style="list-style-type: none">• Check start-disconnect circuit• Check valve clearances
600	<ul style="list-style-type: none">• Change primary filter
2000	<ul style="list-style-type: none">• Grind valves (if required)• Clean holes in rocker box oil line• Check nozzle spray pattern, see Note 2• Clean generator• Replace anti-flicker points
3000	<ul style="list-style-type: none">• Change secondary fuel filter
5000	<ul style="list-style-type: none">• General overhaul (if required) see Note 3

NOTE 1. Water or foreign material in fuel can ruin the injection system. If daily inspection shows water or excessive dirt in sediment bowl, fuel handling and storing facilities should be checked and situation corrected. Primary and secondary fuel filters must be replaced following correction of fuel contamination problem.

NOTE 2. This service must be conducted by trained diesel injection equipment personnel with suitable test facilities. Omit this service until these conditions can be met.

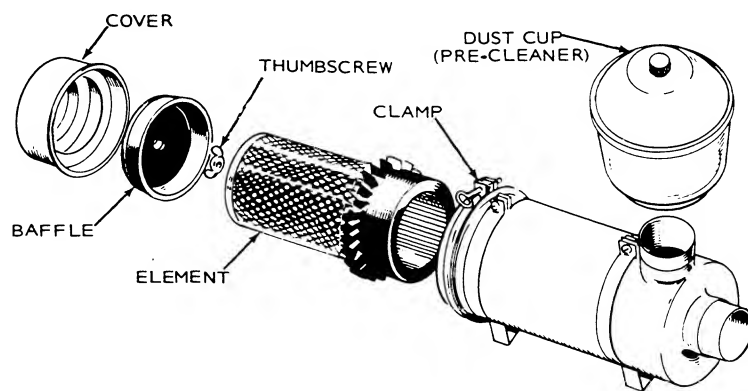
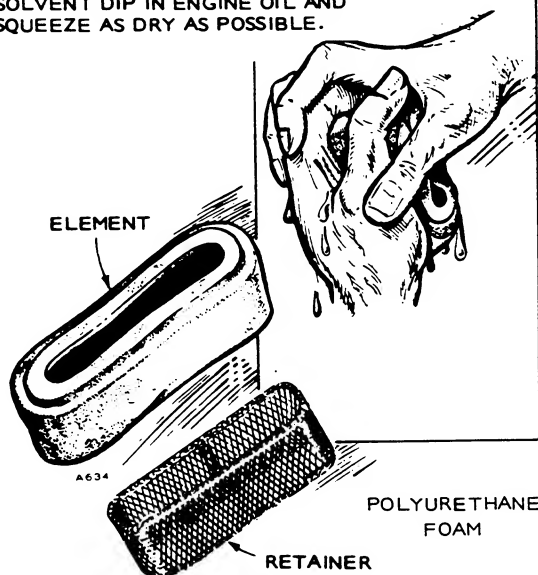
NOTE 3. Tighten head bolts and adjust valve clearance after first 50 hours on a new or overhauled engine.

OIL FILTER CHANGE

Place pan under old filter and remove by turning counterclockwise. Clean filter mounting area. Install new filter, oil filter gasket and turn filter on clockwise until gasket touches mounting base, then tighten 1/4 to 1/2 turn.

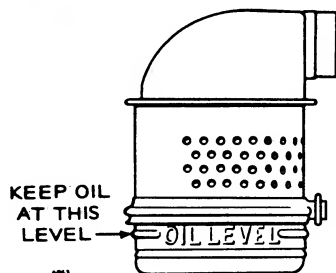
AIR CLEANERS

AFTER WASHING ELEMENT IN SOLVENT DIP IN ENGINE OIL AND SQUEEZE AS DRY AS POSSIBLE.



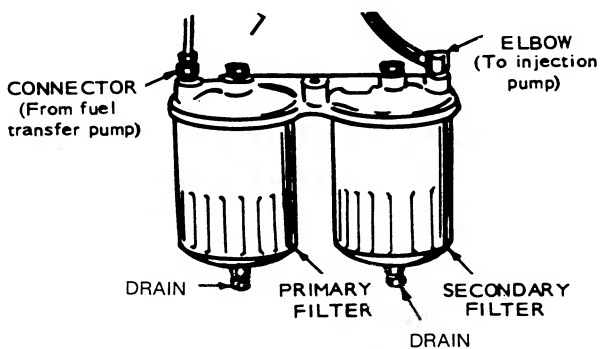
CONTRACTOR MODEL AIR CLEANER

1. Remove pre-cleaner and wash out dirt. Dry and re-install.
2. Loosen clamp and remove end cover.
3. Remove thumbscrew and take out element. Wash element in detergent and water (use new element after 6 washings). Dry and re-install.
4. Remove air cleaner baffle from cover, wash out dirt, and re-install in cover.
5. Install cover with "TOP" up and tighten clamp.



OPTIONAL OIL BATH AIR CLEANER

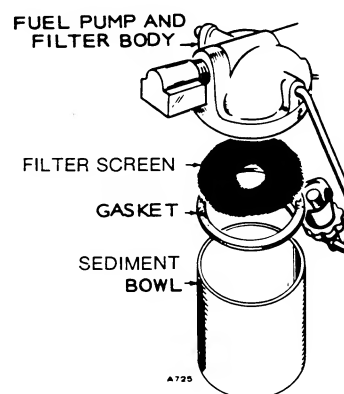
1. Loosen bottom clamp, remove cleaner base and clean.
2. Refill base to oil level mark with fresh oil, same weight as used in engine.



DUAL FUEL FILTER SYSTEM

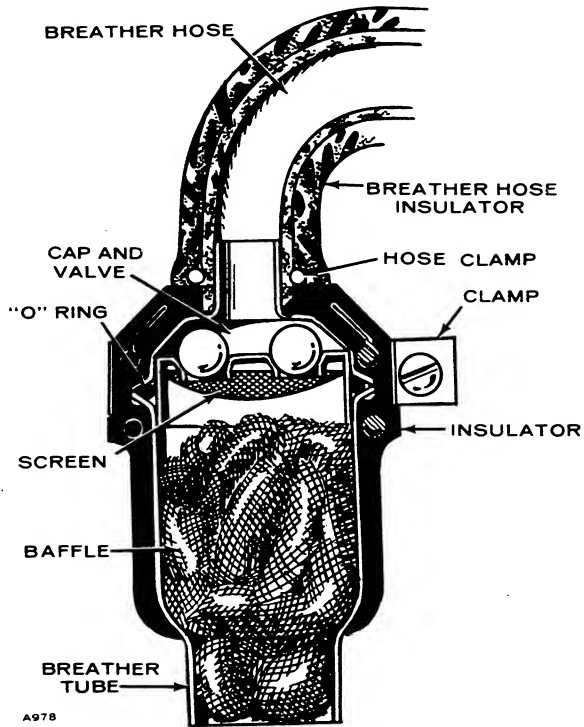
CAUTION

Drain plug on fuel filters can tolerate only a limited amount of torque. Use two wrenches in combination for breaking plug loose and for final tightening.



FUEL FILTERS

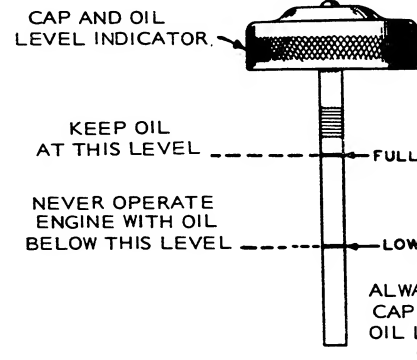
FIGURE 14. AIR CLEANER AND FUEL FILTER MAINTENANCE



A978

Remove hose clamp, breather hose, breather cap clamp and insulator halves to release breather cap and valve assembly. Wash cap and valve assembly and the baffle in suitable solvent and reinstall.

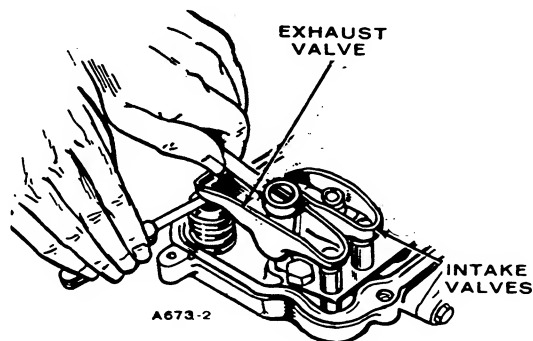
CRANKCASE BREATHER



⚠ WARNING

Do not remove dipstick with engine running; oil will blow out causing possible injury.

OIL LEVEL INDICATOR



VALVE CLEARANCES

FIGURE 15. OIL LEVEL, VALVES, AND CRANKCASE BREATHER MAINTENANCE

[illegible]



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